TITLE

PORTABLE INTEGRATED CIRCUIT MEMORY DEVICE FOR USE WITH UNIVERSAL SERIAL BUS

CLAIM OF PRIORITY

This application makes reference to, incorporates the same herein, and claims all benefits accruing under 35 U.S.C. §119 from my application *MEMORY STICK FOR UNIVERSAL SERIAL BUS* filed with the Korean Industrial Property Office on October 11, 1999 and there duly assigned Serial No. 43872/1999.

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to an auxiliary memory device for use with a personal computer, and more particularly to a portable integrated circuit memory device capable of being used with a universal serial bus (USB).

Description of the Related Art

In the field of personal computers (PCs) and accessories, there has been rapid performance improvements in processors and memories. However, peripheral devices, such as keyboards, mouses, monitors, printers, speakers, microphones, and telephone/fax modems, remained largely unchanged during this period.

1   In an earlier PC arrangement, if peripherals must be connected to a computer, the sheer

2   number of cables makes the connection between the computer and the peripherals complicated. Also,

3   since such a computer is not always provided with a Plug-and-Play function, it is difficult for a PC

4   user to connect peripheral devices to the computer. Furthermore, if an unskilled user strives to install

5   expansion cards, he may be faced with a complex and bewildering collection of dip switches, circuit

6   boards, jumper cables, peripheral drivers, interrupt request (IRQ) settings, DMA channels and I/O

7   addresses that must be configured. To make matters worse, expanding PC functionality will often

8   result in system crashes, thereby causing the economic loss and inconvenience to the user.

9   Universal serial bus (USB) system has been developed as one way to avoid some of the

10   above difficulties. USB brings Plug-and-Play technology to the external input and output devices

11   found on today's high-performance PCs or workstations. USB has three major advanced features as

12   follows: (1) ease of use through hot plugging and automatic configuration, (2) standardized

13   connection points and simplified connector design, and (3) simple expansion through the use of a

14   tiered-star hub topology.

15   With USB, PC users no longer need to worry about selecting the right serial port, installing

16   expansion cards, or the technical headaches of dip switches, jumpers, software drivers, IRQ settings,

17   DMA channels and I/O addresses. USB allows simultaneously attaching and using of multiple

18   devices on the same bus. USB also allows these devices to be attached and removed while a

19   computer system is running and without requiring a reboot to use a newly attached device.

20   Unlike conventional PCMCIA (personal computer card international association) cards or

21   other add-on cards, since USB does not require the investment in expansion cards, the net cost of

1   implementing new peripheral products can be substantially lower. Also, the universal compatibility

2   of USB eliminates much of the cost of testing and validation of varying PC-peripheral-software

3   combinations, while accelerating time-to-market. Thus, USB will clearly continue to be used as a

4   computer peripheral interface for the time being, along with other advanced general-purpose buses

5   such as FW (Fire Wire; sometimes called IEEE1394) bus and SSA (Serial Storage Architecture) bus.

6   What is needed is a portable memory device having a USB interface that can be attached to

7   a USB port on a host computer, allowing a user of the host computer to read and write to the portable

8   memory device. What is also needed is a portable security device that attaches to a USB port of a

9   host computer that allows the user to gain access to the host computer.

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SUMMARY OF THE INVENTION

It is an object of the present invention is to provide an integrated circuit memory device

13   capable of being used with a USB-supporting computer.

It is another object of the present invention to provide an integrated circuit memory device

15   that can be used as a portable memory medium such as a floppy disk.

16   It is still another object of the present invention to provide a portable memory medium having

17   strong immunity to dusts and shocks and having a high data retention reliability.

18   It is still another object of the present invention to provide an electronic security key device

19   for use in a USB-supporting computer or computer-based system.

20   It is yet another object of the present invention to provide a portable memory that attaches

21   to a USB port of a host computer, allowing a user to read and write to and from the portable memory.

1   It is still yet another object of the present invention to provide a security device that attaches

2   to a USB port of a host computer to enable the hard disk drive of the host computer.

3   According to one aspect of the present invention, there is provided a portable memory device

4   for use with a USB-supporting computer or computer-based system, which includes a nonvolatile

5   integrated circuit portable memory for data storage, a USB connector, a USB interface, coupled

6   between the USB connector and the memory, for interfacing the memory with the computer, and a

7   housing for accommodating the memory and the USB interface. In an embodiment, a portable

8   memory device is shaped like a bar or stick, which has a USB connector on its one end and a hole

9   on the other end. The hole can be used for holding a key ring. Also, a connector cover is provided

10   to protect the USB connector from contamination. In another embodiment, the portable memory

11   device serves as a security key that is used to enable the hard disk drive of a host computer when the

12   portable memory is connected to a USB port of a host computer.

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BRIEF DESCRIPTION OF THE DRAWINGS

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15   A more complete appreciation of the invention, and many of the attendant advantages,

16   thereof, will be readily apparent as the same becomes better understood by reference to the following

17   detailed description when considered in conjunction with the accompanying drawings in which like

18   reference symbols indicate the same or similar components, wherein:

19   Fig. 1A is a perspective view of a portable memory device according to the present invention;

20   Fig. 1B is a perspective view illustrating a use of the hole of the memory device of Fig. 1A.

21   Figs. 2A-2C are views showing connector covers of portable memory devices according to

1   the present invention;

2   Fig. 3 shows a connection between a USB memory device according to the present invention

3   and a USB-supporting computer;

4   Figs. 4A-4B are views for explaining the movement of the connector cover of Fig. 3 when

5   the memory device is connected with the computer according to an embodiment of the present

6   invention;

7   Fig. 5 is a block diagram showing a circuit configuration of a USB memory device according

8   to the present invention;

9   Fig. 6 is a flowchart showing operation steps of a computer system when a USB memory

10 device is used as a portable memory medium in the computer system according to an embodiment

11 of the present invention; and

12   Fig. 7 is a flowchart showing operation steps of a computer system when a USB memory

13 device is used as a security key device in the computer system according to an embodiment of the

14 present invention

15   .

16   **DESCRIPTION OF THE PREFERRED EMBODIMENT**

17   Now, the present invention will be described hereinafter more fully with reference to

18 accompanying drawings. If plugged in one of plural USB ports mounted upon a computer system

19 irrespective of kinds of the computer system or its port, a USB memory device is directly recognized

20 in the computer system to conveniently write/read data. The USB memory device is less prone to

1   data loss caused by dusts or shock. Moreover, a small-sized USB memory device results in its

2   portability.

3   Fig. 1A is a perspective view of a portable memory device 100 according to the present

4   invention, and Fig. 1B is a perspective view illustrating a use of the hole 90 of the memory device

5   100 of Fig. 1A. Referring now to Fig. 1A, the portable memory device 100 with a USB connector

6   40 is an external integrated circuit memory device being capable of substituting a floppy disk drive

7   of a data processing system such as a USB-supporting computer. The memory device 100 can be

8   used as a sub-memory of data processing systems to accommodate peripherals such as a digital

9   camera, a digital video camera, electronic calculator, and so on. The memory device 100 can be

10   shaped like a bar or stick.

11   Referring to Fig. 1B, the memory device 100 is portable owing to its small size. The memory

12   device 100 comprises a nonvolatile integrated circuit memory and a USB interface within a housing.

13   The housing prevents data loss caused by dust or shock in the memory device 100. The memory

14   device 100 has a USB connector 40 on its one end and a hole 90 on the other end. The hole 90 can

15   be used for holding a key ring. On the USB connector 40, a connector cover is coupled for protecting

16   the USB connector.

17   Figs. 2A-2C show structures of a connector cover 42 and a housing of the USB memory

18   device 100 shown in Figs. 1A-1B to illustrate insertion and movement of the connector cover 42.

19   In case that the USB connector 40 is uncovered with the connector cover 42, it is likely to be

20   damaged when a user carries the memory device 100. Therefore, the memory device 100 according

21   to the present invention has the connector cover 42 for protecting the USB connector 40 from

1   damage.

2   Referring now to Fig. 2A, a housing of the USB memory device 100 comprises one or two

3   concave parts 44 on one or two sides of the housing, and the connector cover 42 comprises one or

4   two convex parts 46 on one or two sides of the connector cover 42. The concave part 44 mates with

5   the convex part 46 and are used for inserting the connector cover 42 into the housing of the USB

6   memory device 100.

7   Referring now to Fig. 2B, the USB connector cover 42 is inserted to the housing of the USB

8   memory device 100. The connector cover 42 covering the USB connector 40 is capable of moving

9   back and forth along the concave part 44 of the housing.

10   Referring to Fig. 2C, the USB connector cover 42 moves backward toward hole 90 and away

11   from the USB connector 40 along the concave part 44. For example, if the USB memory device 100

12   is connected to external devices through the USB connector 40, the cover 42 moves backwards from

13   the USB connector 40 along the concave part 44 of the housing of the USB memory device 100

14   shown in Fig. 2A or Fig. 2B.

15   Fig. 3 is a perspective view illustrating a connection between a USB memory device 100 and

16   a USB-supporting computer 10. Referring to Fig. 3, peripheral devices 20 and 100 connected to the

17   USB-supporting computer 10 are powered by the computer 10 without additional power supply

18   device. Since all of the USB devices use USB standard ports, USB devices based on a USB standard

19   can be used in the computer 10 without considering order or location of the USB ports. In addition,

20   the USB devices support a Plug-and-Play function in the computer 10. The USB device can be

21   recognized automatically in the computer 10 or an operation system, without resetting the computer

1   10. If a USB memory device 100 is connected to one of USB ports 12 and 14 of the computer 10,

2   the memory device 100 is directly recognized as an integrated memory device such as a floppy disk

3   by the Plug-and-Play function. The USB memory device 100 can be used more efficiently in a

4   portable computer having no floppy disk drive.

5   In addition, the USB memory device 100 can contain security information to perform security

6   function in the computer, such as a hardware key to prevent data access of an unauthorized user. This

7   security function of the USB memory device 100 will be described in detail later.

8   Figs. 4A-4B are views illustrating movement of the connector cover 42 of the USB memory

9   device 100 of Figs. 2A-2C when the USB memory device 100 is coupled to a portable computer

10 system 10. Referring now to Fig. 4A, a spring 48 is coupled between the concave part 44 of the

11 housing and the connector cover 42 to control movement of the cover 42. When the USB memory

12 device 100 is not connected to any device, the spring 48 is stretched, as shown in Fig. 4A. If the USB

13 memory device 100 is connected to a USB port 14 of the portable computer 10, the cover 42 is

14 pushed along an arrow and the spring 48 is compressed as shown in Fig. 4B. While the USB

15 connector 40 and the USB port 14 are connected to each other, the spring 48 remains compressed.

16 If the USB connector 40 and the USB port 14 are separated from each other, the spring 48 is

17 decompressed, as shown in Fig. 4A, to make the connector cover 42 cover the USB connector 40..

18 Fig. 5 schematically illustrates architecture of a USB memory device 100. Referring to Fig.

19 5, a USB memory device 100 comprises a USB connector 40 connected to a USB port of a data

20 processing system, a nonvolatile integrated circuit memory 60 for writing/reading data to/from the

21 data processing system, and a USB interface 50 connected between the USB connector 40 and the

1   memory 60, for carrying out interface between the data processing system and the memory 60. The

2   memory is composed of a flash memory, such as a flash EEPROM (electrically erasable and

3   programmable read only memory), and so on.

4   As mentioned above, the USB memory device 100 is recognized as an integrated memory

5   device writing/reading data such as a floppy disk by the Plug-and-Play function. Moreover, the USB

6   memory device 100 can store security and privacy information (e.g., identification number, passport

7   number, etc.) to recognize a user by organizing database of the information. The security information

8   functions as a password, so that the security information is used for verifying an authorized user.

9   Thus, the USB memory device 100 storing the security information can be used as a hardware key

10   to permit that only authorized user access to data stored in a hard disk.

11   Fig. 6 is a flowchart showing operation steps of a computer system when a USB memory

12   device is used as a portable memory medium such as a floppy disk. Referring now to Fig. 6, at step

13   S10, power is applied to the computer system. At step S12, power on self test (POST) is carried out.

14   In step S14, the USB memory device is recognized by the computer system. In step S16, booting is

15   performed by an operation system (OS). In step S18, data is written/read out to/from the USB

16   memory device.

17   The operation steps shown in Fig. 6 are described, when the power is applied to the computer

18   system after plugging the USB memory device in the computer system. If the USB memory device

19   is plugged in the computer system while applying the power to the computer system, the memory

20   device is automatically recognized by the Plug-and-Play function.

21   Fig. 7 illustrates operation steps of a computer system when a USB memory device is used

1   as security key device such as a hardware key. Referring now to Fig. 7, in step S30, power is applied

2   to the computer system. In step S32, power on self test (POST) is carried out. In step S34, it is

3   determined whether the USB memory device is connected to the computer system. If not connected,

4   the control flow proceeds to step S42 wherein an error message is displayed to insert a USB memory

5   device into the computer system. If connected, the control flow proceeds to next query step S36. At

6   step S36, it is determined whether a security information stored in the USB memory device is

7   matched to a security information stored in the computer system by a microcontroller (not shown)

8   of the computer system. The microcontroller contains a program for comparing the security

9   information from the USB memory device with the security information of the computer system, and

10   verifies an authorized user by the comparing result. If the security information is not correct, the

11   control flow continues to step S42 wherein an error message is displayed to insert a right USB

12   memory device storing reasonable security information into the computer system, and then the flow

13   returns to step S34. If the security information from the USB memory device is matched with the

14   security information of the computer system, the control flow continues to step S38 wherein a hard

15   disk is enabled. In step S40, booting is performed by an operating system (OS). According to the

16   above described operating steps, the USB memory device can be used as a security key device

17   including a security information to control data access of the hard disk.

18   As a result, the USB memory device according to the present invention can write/read data

19   as an integrated memory circuit after connecting to the USB-supporting computer system irrespective

20   of kinds of the computer system and its ports. In addition, the USB memory device can be used as

21   a security key device storing a security information. Further, the USB memory device is less

1   dangerous of data loss, and is more portable owing to its small size.